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THE BUBBLY CREEK WATER SOFTENING PLANT[1]

By C. A. Jennings

The Bubbly Creek filtration plant at the Chicago Union Stock Yards requires no introduction. It has stood in a class by itself purifying probably the most polluted supply of any water purification system in the country. It was at this plant that hypochlorite of lime was first used on a practical scale for water disinfection, in the summer of 1908. Numerous articles have appeared about this plant, its operation and the wonderful results obtained. The results have been uniformly good. To many people, the results have been almost unbelievable.

The Bubbly Creek water softening plant is in its infancy and needs an introduction. At the present time the record of the filtration plant is much better than is that of the softening plant, as will be explained later. The plants are one and the same.

An agreement was entered into with the city of Chicago several years ago about the use of the filtered water from the Bubbly Creek plant. Since that time, the filtered water has not been used for watering live stock but its use has been confined to mechanical purposes. At no time, however, has the purification been discontinued, as much care is being used now to obtain a satisfactory degree of purity at all times as was used formerly.

The conditions and problems to be met with in order to soften the water with this plant were somewhat novel and peculiar to local conditions. The power house of the Union Stock Yard and Transit Company, the same company that owns the filtration plant, is nearby. The boilers there require about 125,000 gallons of water per day. Previously they have been supplied with the returns from the heating system, some 50,000 or 60,000 gallons per day, and the balance of the water was taken from the Permutit system softening city water. The Chicago Junction Railway has some 50 or 55 locomotives operating in the Stock Yards. They have been supplied with filtered water that was not softened. The amount used averages about 600,000 gallons per day. Considerable filtered water has been used for flushing for a high pressure fire system and for condensing purposes.

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[1] Presented at meeting Illinois Section, January 25, 1916.

It was decided to soften the water from Bubbly Creek and use it for the same purposes as heretofore and, in addition, in the boilers in the power house, replacing city water softened by the Permutit system.

The filtration plant was designed for 5,000,000 gallons per day with a period of coagulation and sedimentation of three hours. For several years only one chemical, alum, has been used as a coagulant. Mixture with the raw water was secured by introducing the solution into the suction of the low service centrifugal pump because the over-and-under baffles originally in the mixing canal had to be taken out as it was impossible to flush out the settled sludge from the bottom of this canal. End baffles on 18 inch centers were installed in the mixing canal in preparation for softening the water. These give a fair but not satisfactory agitation and mixing. Mechanical agitators, air agitation and a false floor in the mixing canal to reduce the depth from 20 feet to 6 or 8 feet have been considered as possible solutions for this trouble.

From an analysis of an average sample of the raw water, it should require 6.5 g. p. g. lime; 2.1 g. p. g. of soda ash and from practical experience about 1.25 g. p. g. alum in the treatment of this water. Various quantities of chemicals have been tried, starting with lime, 7 g. p. g., soda ash, 2.1 g. p. g., and alum, 1.25 g. p. g., and now with lime 9.0 g. p. g.; soda ash, 3.1 g. p. g., and iron sulphate, 1.5 g. p. g. The substitution of sulphate of iron for alum was made because the former could be used equally as well and was much cheaper. Alum was being quoted at $20 per ton, and is even considerably higher than that now, while sulphate of iron was quoted at $11 per ton. At the figures given as the present quantities of chemicals being used, the chemical cost for softening is 2.38 cents per 1000 gallons.

The water would have been uniformly softened but not to the limit, except for several reasons. As mentioned above, the plant was designed for 5,000,000 gallons per day and at that rate the settling basins have a three hour capacity. The consumption of the filtered and softened water varied from a rate of 500,000 gallons to 2,500,000 gallons per day. The clear water storage well beneath the filters has a capacity of 250,000 gallons or about 2½ hours supply at the maximum rate of pumpage. With this variable rate of consumption, the period of coagulation and sedimentation varied from 15 hours to 6 hours. The hardness of the raw water, which receives all kinds of sewage and trade wastes, varies from 10 to 15 grains per gallon. The hardness of the softened water has varied from 5.5 to 7.0 grains per gallon as the conditions varied.

The softening process at the Bubbly Creek plant has been in operation less than two months. A number of changes have been made and the results have been bettered. It is hoped that even more can be accomplished by means of changes now being contemplated.